



⑫

EUROPEAN PATENT APPLICATION

⑬ Application number: 90302424.8

⑮ Int. Cl. 5: H04B 1/40

⑭ Date of filing: 07.03.90

⑯ Priority: 29.03.89 FI 891513

⑰ Date of publication of application:
03.10.90 Bulletin 90/40

⑱ Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

⑲ Applicant: NOKIA MOBILE PHONES LTD.
P.O. Box 86
SF-24101 Salo(FI)

⑳ Inventor: Ikonen, Raimo
Kurvirtie 1 as 3
SF-25360 Pertteli(FI)
Inventor: Lonka, Pekka
Alastuvankatu 3 as 4
SF-24240 Salo(FI)
Inventor: Mikkola, Pekka
Mököistenkatu 1 as 10
SF-24100 Salo(FI)

㉑ Representative: Crawford, Andrew Birkby et al
A.A. THORNTON & CO. Northumberland
House 303-306 High Holborn
London WC1V 7LE(GB)

㉒ Method for decreasing the barrier attenuation requirements set on a duplex filter in a digital radio telephone.

㉓ In the method according to the invention, the barrier attenuation requirements set on a duplex filter in a digital radio telephone can be reduced by placing a diode limiter (D1, D2) between the filter (1) and the receiver (5). The limiter prevents the access to the receiver (5) of a transmission signal which has passed the filter and might damage the receiver. Preferably the limiter comprises diodes (D1, D2) coupled in antiparallel between the signal line and ground, with an inductance (L) in parallel with them.

A2

EP 0 390 354 A2

Method for decreasing the barrier attenuation requirements set on a duplex filter in a digital radio telephone

The invention relates to a method by means of which it is possible to reduce the barrier attenuation requirements set on a duplex filter in a radio telephone.

Patent application FI-883789 proposes that in a system based on digital time division multiplexing (TDMA) the rf switch be replaced with a duplex filter which prevents the access of the transmission of the telephone itself to the receiver and the access of a received signal to the transmitter. The filter can be conceived as two separate filters of which one part is between the antenna coupling and the transmitter and the other part between the antenna coupling and the receiver. When high transmission powers are used, for example in a digital GSM system the transmission power is 20 W, high demands are set with respect to attenuation on the filter part between the antenna and the receiver, since the transmission power must not pass to the receiver and possibly break it. As a consequence of the high attenuation requirement, the filter becomes more complex, its size becomes large and its weight increases. This also increases manufacturing costs. The filter in a radio telephone should be as simple and light as possible in spite of the high attenuation requirement.

The object of the present invention is to provide a method by which the barrier attenuation requirements set on a filter can be reduced. According to the basic idea of the invention, signals which have passed the barrier filter and are too intense for the receiver are limited so that they constitute no risk to the receiver. By limiting the signals after the barrier filter it is possible to reduce the attenuation requirements set on the filter itself, in which case the filter can be made small and simpler than without the limiter. Diodes can be simply used as the limiter.

The invention is described below in greater detail with reference to the accompanying drawing.

The figure shows diagrammatically the coupling of the duplex filter in a digital radio telephone to the other blocks of the telephone. The duplex filter 1 has three ports: one port for the transmission signal arriving at the filter, one antenna port, and one port for the receiver. The received signal coming from the antenna 6 travels via the block 3 of the bandpass filter 1 to the receiver 5. Respectively, a signal coming from the transmitter 4 passes via the block 2 of the filter to the antenna 6. For this signal the filter block 3 is seen as a high impedance. As stated above, in practice, as the requirements set on barrier attenuation increase, the structure of the filter becomes more complex

and its size increases. In order to be able to maintain the barrier attenuation requirement at a reasonable level, diodes D1 and D2 are coupled in anti-parallel on the signal line between the block 3 and the receiver 5, between the line and the ground of the device. The diodes used can be advantageously Schottky diodes because of their low forward current. Other diodes having a low threshold voltage can also be used. Common silicon diodes having a threshold voltage of approximately 0.7 V are also possible, provided that the first transistor of the receiver can withstand the power passing through the diode limiter. Coil L is also coupled in parallel with the diodes. Its purpose is to compensate, within the frequency range used, for the capacitance, of the diodes and to zero the dc level in order that the diodes should function symmetrically. The diode limiter does not load the transmitter very much, since the block 3 of the duplex filter 1 suitably separates the limiter from the transmitter.

By using a diode limiter according to the invention it is possible, owing to the lower barrier attenuation requirement, to make the duplex filter smaller and simpler than when a diode limiter is not used. In particular, the diode limiter according to the invention is intended for use in a radio telephone system based on digital time division multiplexing (TDMA).

Claims

1. A method for reducing the barrier attenuation requirement of a duplex filter in a digital radio telephone, characterized in that there is a diode limiter (D1, D2) disposed between the duplex filter (1) and the receiver (5).
2. A method according to Claim 1, characterized in that the diode limiter comprises diodes (D1, D2) coupled in antiparallel between the signal line and ground.
3. A method according to Claim 1, characterized in that the diodes (D1, D2) are diodes having a low threshold voltage, for example Schottky diodes.
4. A method according to Claim 1, characterized in that, in order to compensate for the capacitance of the diodes (D1, D2) and to zero the dc level, an inductance (L) is coupled in parallel with the diodes (D1, D2).

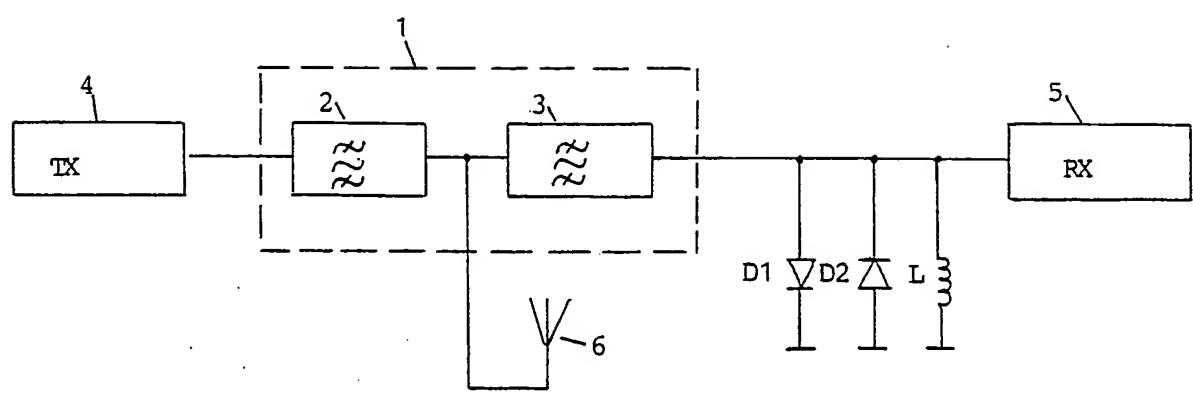


FIG.



Europäisches Patentamt
European Patent Office
Office européen des brevets



⑪ Publication number:

0 390 354 A3

⑫

EUROPEAN PATENT APPLICATION

⑬ Application number: 90302424.8

⑮ Int. Cl. 5: H04B 1/40, H04B 1/48

⑭ Date of filing: 07.03.90

⑯ Priority: 29.03.89 FI 891513

⑰ Date of publication of application:
03.10.90 Bulletin 90/40

⑲ Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

⑳ Date of deferred publication of the search report:
04.12.91 Bulletin 91/49

㉑ Applicant: NOKIA MOBILE PHONES LTD.
P.O. Box 86
SF-24101 Salo(FI)

㉒ Inventor: Ikonen, Raimo
Kurvinne 1 as 3
SF-25360 Perttilä(FI)
Inventor: Lonka, Pekka
Alastuvankatu 3 as 4
SF-24240 Salo(FI)
Inventor: Mikkola, Pekka
Mököistenkatu 1 as 10
SF-24100 Salo(FI)

㉓ Representative: Crawford, Andrew Birkby et al
A.A. THORNTON & CO. Northumberland
House 303-306 High Holborn
London WC1V 7LE(GB)

㉔ Method for decreasing the barrier attenuation requirements set on a duplex filter in a digital radio telephone.

㉕ In the method according to the invention, the barrier attenuation requirements set on a duplex filter in a digital radio telephone can be reduced by placing a diode limiter (D1, D2) between the filter (1) and the receiver (5). The limiter prevents the access to

the receiver (5) of a transmission signal which has passed the filter and might damage the receiver. Preferably the limiter comprises diodes (D1, D2) coupled in antiparallel between the signal line and ground, with an inductance (L) in parallel with them.

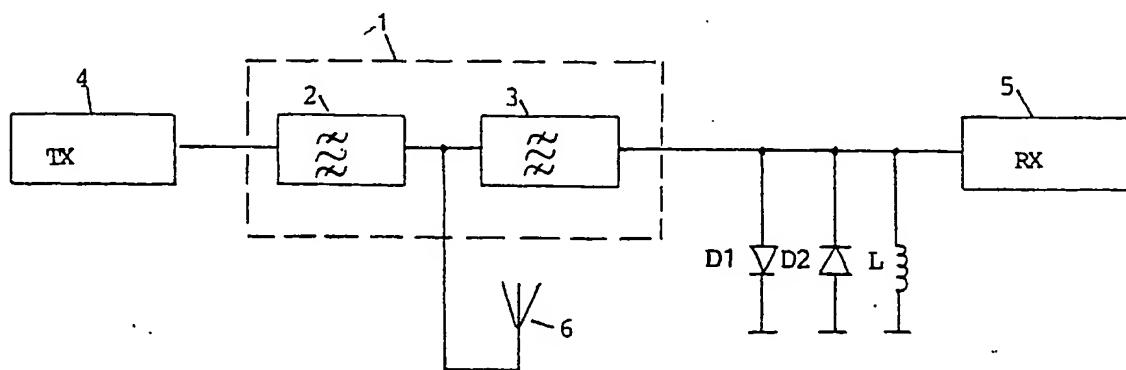


FIG.

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
X	WIRELESS WORLD, vol. 81, no. 1469, January 1975, page 12; A. LIEBER: "Passive solid-state antenna switch" * The whole document * - - -	1-4	H 04 B 1/40 H 04 B 1/48
A	FR-A-2 371 784 (LIGNES TELEGRAPHIQUES) * Page 5, lines 4-13; claim 1; figure 1 * - - -	2-4	
E	EP-A-0 441 500 (TECHNOPHONE) * Abstract; figure 1 * - - - - -	1	
The present search report has been drawn up for all claims			
Place of search	Date of completion of search	Examiner	
The Hague	24 September 91	LYDON M.C.P.	
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention		E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons S: member of the same patent family, corresponding document	